BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Study

Region: Pacific

Planning Area(s): Hawaii

Title: Habitat Affinities and At-sea Ranging Behaviors among Main Hawaiian Island Seabirds (PC-13-03)

BOEM Information Need(s) to be Addressed: BOEM and the state of Hawaii have received proposals to develop offshore renewable energy related projects within state and federal waters surrounding the main Hawaiian Islands (MHI), and both agencies have formed a renewable energy taskforce. Presently, there is increasing interest in research leases and commercial-scale projects offshore the MHI. For example, the state is planning an inter-island power cable to transmit electricity from renewable energy projects (wind) between the islands of Lanai and Molokai to load centers on Oahu and possibly Maui. In addition to future infrastructure, such cable-laying operations (especially lighted operations at sea) pose a ship-strike or grounding risk to free-ranging seabirds that are prone to light attraction. Such risk is expected to vary according to species, time of year, and environmental conditions. Currently there is a lack of quantitative information that links distribution, movements, and behaviors among seabirds with physical habitats in waters surrounding the MHI. More information is needed by BOEM to evaluate potential environmental effects to seabirds and their oceanic habitats caused by installation of new renewable energy infrastructure within OCS waters off Hawaii.

Total BOEM Cost: $900,000 **Period of Performance:** FY 2013-2016

Conducting Organization: U.S. Geological Survey

Principal Investigators: Josh Adams and Julie Yee

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Description:

Background: The MHI and associated offshore islets provide substantial breeding habitat for more than a dozen seabird species including shearwaters, albatrosses, petrels, frigatebirds, boobies, tropicbirds, and terns. Two main island species, the Newell's Shearwater and Hawaiian Petrel are listed under the Endangered Species Act (ESA) as threatened and endangered, respectively. Presently, very little is known about breeding population sizes and trends, breeding biology, and foraging ecology among MHI seabirds. The suite of seabirds that comprise the Hawaiian community are uniquely adapted to relatively low productivity waters and patchy prey resources. Several species co-depend on schooling predatory fishes and odontocete cetaceans to locate and make available important forage fishes and squids, and therefore, certain Hawaiian seabirds can be used to identify ocean regions of important community-level food-web interactions and trophic transfer of energy. Furthermore, certain Hawaiian seabirds have adapted ranging behaviors, morphologies and flight characteristics that capitalize on energy associated with predominant wind patterns and wave energy. Hawaiian seabirds face increasing threats at

sea including competition with fisheries, pollution and marine climate change. Increasing interest in ocean-based renewable energy and certain activities associated with development of these energy resources may pose additional risks for seabirds. For example, there is increasing documentation of seabird interactions with wind-turbine structures, lighted facilities, and elevated power lines on land and lighted ships at sea within OCS waters off Hawaii. Risk depends on seabird behavior at sea (e.g., time per area, soaring flight behavior associated with wind speed/direction and wave height/direction).

A recently approved FY 2012 Study Plan seeks to establish a *Seabird Vulnerability Index* based on observations of seabirds at sea recorded from ships and archived in extensive historic databases. These data primarily are focused on the California Current and Eastern Tropical Pacific, and include much less information regarding seabirds in OCS waters off Hawaii. The USGS is currently acquiring behavioral data from seabirds in Hawaii and the California Current using sophisticated telemetry techniques that enable measurements of flight behaviors associated with ranging patterns, wind speed/direction, and sea-state. Furthermore, USGS and collaborators have generated predictive models of fine-scale wind and wave fields for waters surrounding the MHI. This proposed study will provide additional detailed information linking abundant Hawaiian breeding seabirds with coastal and offshore habitat utilization surrounding the MHI and help link surface wind and wave direction data with proposed *in situ* seabird bird telemetry data. We expect this study to be awarded through an Interagency Agreement with USGS.

Objectives: Increase BOEM's understanding of at-sea habitat utilization and ranging behaviors for seabirds breeding within the MHI by: (1) Conducting multi-species and multi-scale quantifications of at-sea habitat utilization and ranging behaviors for seabirds breeding within the MHI; and (2) compiling and providing an analysis of remotely sensed and model-derived habitat data (e.g., chlorophyll concentrations, sea surface temperature (SST), sea surface height, sea level pressure, and wind speed/direction) to examine habitat relationships that can be used to predict species' distributions and improve spatial vulnerability maps.

Methods: (1) Existing recent USGS telemetry-based information on at-sea utilization and behavior (albatrosses, petrels), and past and ongoing information collected by other agencies (e.g., NOAA), will be combined with new measurements of at-sea habitat utilization (Global Positioning System (GPS), Ultra High Frequency (UHF), and Global Location Service (GLS)-based telemetry and archival sensors) among the most abundant (and multi-species, seabird/tuna/dolphin-affiliated), near-island foraging species (e.g., Wedge-tailed Shearwater). For species that frequent MHI waters (e.g., Great Frigatebird), tracking deployments will be targeted at significant roosting areas (e.g., Molokini off Maui Nui); (2) spatially-explicit habitat modeling will be used to combine seabird utilization with oceanographic habitat to generate mapped species probability distributions and multi-species data will be combined to delineate community-level hotspot areas considering interannual differences of oceanographic conditions and changing climate (ENSO etc.); and (3) numerical models will be generated that relate flight behavior with fine-scale (2-6 km) winds and waves to evaluate 3-dimentional risk.

Current Status: Awarded on June 13, 2013. Starting in late July, after permitting and contracting was in place, transmitters were deployed on Wedge-tailed Shearwaters and Hawaiian Petrels to initiate the tracking studies. Additional species will be outfitted with transmitters in

June 2014, including Red-tailed Tropicbirds, Laysan Albatrosses, Black-footed Albatrosses, and Red-footed Boobies.

Final Report Due: March 2016

Publications Completed: None at this time.

Affiliated WWW Sites: None at this time.

Revised date: September 25, 2013